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First record of *Erysiphe syringae-japonicae* in Turkey

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Abstract — *Erysiphe syringae-japonicae* was reported on leaves of *Syringa vulgaris* for the first time from Turkey. A short description, distribution, and illustrations for this powdery mildew fungus are provided and discussed briefly.

Key words — Asia Minor, *Erysiphales*, invasive species, lilac, *Microsphaera*

Introduction

A powdery mildew collected in Japan on the lilac, *Syringa amurensis* var. *japonica* [= *S. reticulata*], was described by Braun (1982) as *Microsphaera syringae-japonicae* (*Erysiphales*, *Ascomycota*). Later, this species was reported from the Russian Far East (Bunkina 1991, as "*Microsphaera syringae*") and from Korea (Shin 2000). *Microsphaera syringae-japonicae* was already known on lilacs in North America and Europe, and was distinguished from *M. syringae*, mainly by its evanescent mycelium, its larger number of spores in the ascus, and its usually more extensively pigmented chasmothecial appendage bases.

In 1988, one of the authors (VP Heluta) critically examined the type specimens of powdery mildews described from the Russian Far East, and showed that one of them, the type specimen of *M. aceris* on leaves of *Acer barbinerve,* had chasmothecia identical to those of *M. syringae-japonicae*. However they were in adherent groups that could have drifted from another host such as a *Syringa* sp. Thus, *M. aceris* is an earlier synonym for *M. syringae-japonicae* and has priority within the genus *Microsphaera* Lév. However, as already discussed by Braun et al. (2003) and Braun & Cook (2012), *Microsphaera* is now considered a section of the genus *Erysiphe* DC.; as the epithet *aceris* is already occupied in *Erysiphe*, the correct current name is *E. syringae-japonicae* [≡ *M. syringae-japonicae*].

In the 1990s, *E. syringae-japonicae* from East Asia was introduced into Europe (Seko et al. 2008, 2011), where it is now common in Germany, Poland, Russia, Ukraine, Switzerland, etc. (Braun 1998, 2002, Piątek 2003, Heluta 2006, Rusanov & Bulgakov 2008, Braun & Cook 2012). However, it had not been reported in either the European or Asian parts of Turkey until autumn 2012, when one of the authors (I. Akata) collected it on *Syringa vulgaris* in Ankara.

Materials & methods

Chasmothecia were studied on herbarium material dried between papers at 22–24°C. They were examined in distilled water and photographed under a light microscope «Primo Star» (Carl Zeiss, Germany) using the Camera «Canon A 300» and software «AxioVision 4.7». Digital data were analysed statistically with n ≥30 for each character. For study under the scanning electron microscope (JSM–6060LA, Japan), dried pieces of infected *Syringa* leaves were glued onto the metal stubs and coated with gold.

Identification was made using the descriptions of Braun & Cook (2012). In addition, the specimen was compared with samples of *E. syringae-japonicae* collected in Germany, Switzerland, Ukraine, and the Russian Far East. The studied materials are deposited in the National Herbarium of M.G. Kholodny Institute of Botany, National Academy of Sciences of Ukraine, Kiev, Ukraine (KW).

Taxonomy

Erysiphe syringae-japonicae (U. Braun) U. Braun & S. Takam., Schlechtendalia 4: 14. 2000. Figs 1, 2

≡ *Microsphaera syringae-japonicae* U. Braun, Mycotaxon 15: 121. 1982.

= *Microsphaera aceris* Bunkina, Komarovskie Chteniya 21: 82. 1974 [non *Erysiphe aceris* DC. 1815].

≡ *Erysiphe acerina* U. Braun & S. Takam., Schlechtendalia 4: 5. 2000.

Mycelium amphigenous, white, often effused or in patches, evanescent to sub-persistent. Hyphae thin, up to 7 µm wide. Hyphal appressoria well developed, lobed, in opposite pairs or sometimes single. Chasmothecia brown to dark brown, scattered to gregarious on the leaf surface, 70–90 µm diam. Peridium cells polygonal to almost rounded, 10–16 × 18–21 µm. Appendages 4–12, equatorial, aseptate, stiff, usually straight to rarely curved, smooth to rough, thick-walled, hyaline but brownish or brown at the base, 75–130 µm long, apices 4–5 times regularly dichotomously branched often in three dimensions (i.e., branched part not fully flat), rather compact, sometimes primary and secondary branches elongated and therefore apical parts somewhat deeply forked, tips recurved. Asci 3–6, sessile or short-stalked, broadly ellipsoid or slightly ovoid, hyaline, 40–55 × 30–40 µm, (5–) 6–8-spored. Ascospores hyaline, ellipsoid or ovoid, 16–22 × 11–14 µm.

Specimen examined — **TURKEY**, **Ankara**, Tandogan, 39°56′N 32°49′E, alt. 860 m, on *Syringa vulgaris* L. (*Oleaceae*), 17.10.2012, Ilgaz Akata (KW 40328F).

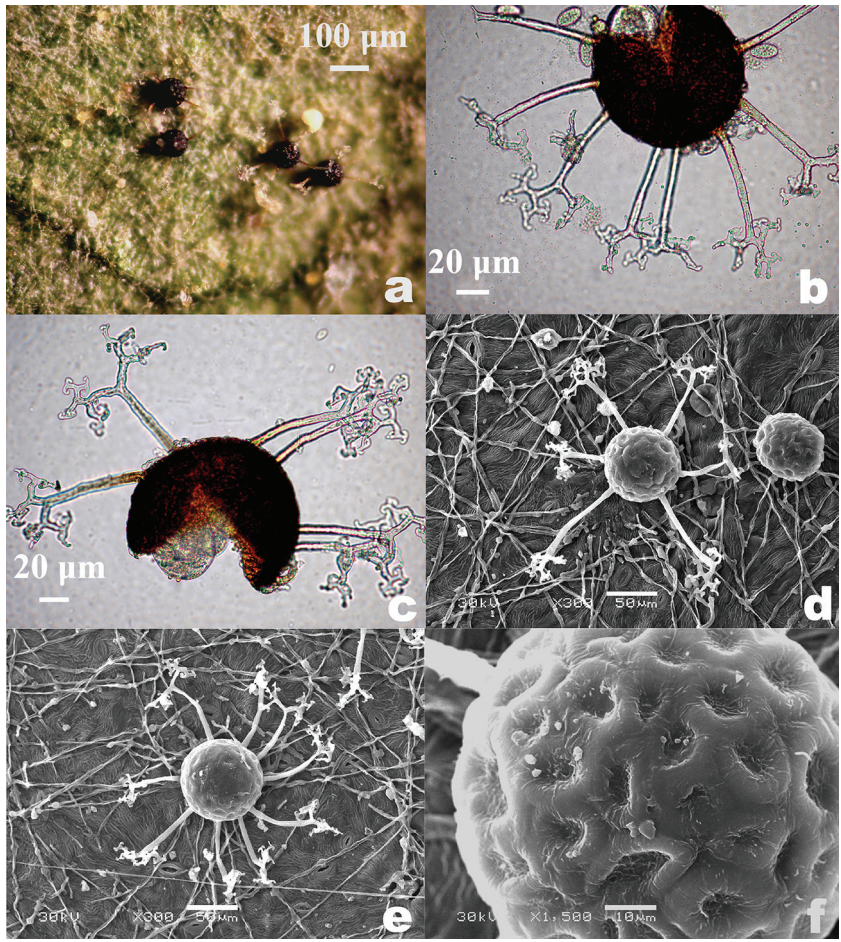

Fig. 1. *Erysiphe syringae-japonicae* (KW 40328F) on *Syringa vulgaris*: **a** – chasmothecia on the host plant leaf (upper surface, in reflected light); **b, c** – chasmothecia splitting with release of ascospores (**b**) and asci (**c**) and with appendages colored at the base; **d, e** – chasmothecia with appendages (SEM); **f** – surface of the peridium (SEM).

Discussion

Many *Syringa* species are cultivated in different countries of the northern hemisphere as important ornamental plants. Some of them are susceptible to powdery mildew caused by *Phyllactinia fraxini* (DC.) Fuss and two species of *Erysiphe* sect. *Microsphaera*. *Phyllactinia fraxini* is uncommon and causes little harm to its hosts. The other two species, *E. syringae* and *E. syringae-japonicae*,

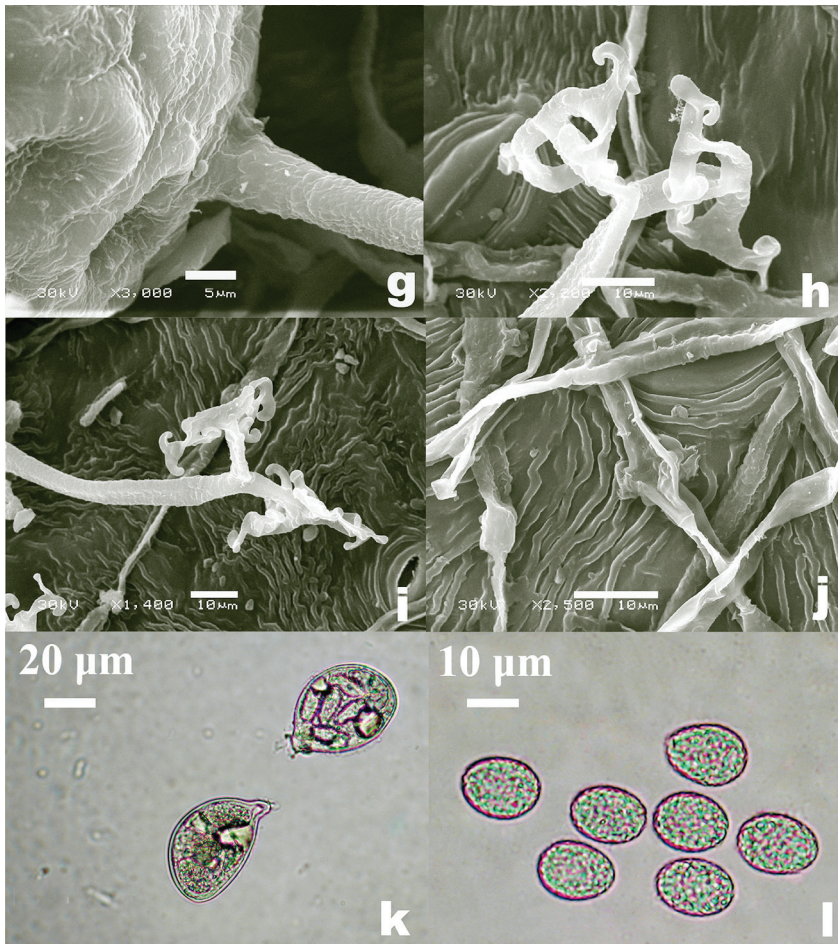

Fig. 2. *Erysiphe syringae-japonicae* (KW 40328F): **g** – basal part of chasmothecial appendage (SEM); **h, i** – apical parts of appendages (SEM); **j** – paired hyphal appressoria (SEM); **k** – asci; **l** – ascospores.

are common, and *E. syringae-japonicae* especially can harm the hosts. Seko et al. (2008, 2011) studied the worldwide spread of these fungi and found the origin of *E. syringae* to be North America from whence it was introduced to Europe, East Asia, and South America. However, recently the fungus has been supplanted by the Asian *E. syringae-japonicae,* particularly in Europe. The last time *E. syringae* was collected in Ukraine was in 2003 (Seko et al. 2011), where it formed only the anamorph.

Erysiphe syringae and *E. syringae-japonicae* are different genetically (only 94% similarity between the ITS sequences of the two species; see Seko et al. 2008) as well as morphologically. *Erysiphe syringae* has typically 4–5-spored asci and nearly colorless appendages, while the asci of *E. syringae-japonicae* contain (5–)6–8 spores and its appendages are more or less pigmented from their base up to the middle part. Thus, these species can be easily distinguished by morphological analysis.

Lilac (*Syringa vulgaris*) is also cultivated in Turkey as an ornamental plant. According to the recent literature on Turkish powdery mildews in Turkey, only *E. syringae* has been previously reported on this plant (Bahcecioglu & Yildiz 2005; Bahcecioglu et al. 2006; Kabaktepe & Bahcecioglu 2006, 2009; Kavak 2011; Severoglu & Ozyigit 2012), and there is no record of *E. syringae-japonicae*. However, our sample is identical to the specimens collected in Europe, especially in Ukraine. Thus, the spread of *E. syringae-japonicae* in Turkey needs more research and monitoring.

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